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THE LIMESTONE PRAIRIES OF WILCOX COUNTY, ALABAMA

Roland M. Harper

Wilcox County lies just south of the well-known black prairie belt of Alabama, and all available statistics of soils, vegetation, population and agriculture point to its being the most fertile county south of that belt. Much of its fertility is due to the presence of several square miles of strongly calcareous soils in the northeastern half. A strip averaging four or five miles wide at the inland edge of the county is characterized by the Ripley formation (uppermost Cretaceous), which has considerable limestone and marl in it, and east of the Alabama River this is bordered on the south by the Midway limestone, of lowest Eocene age. The superficial non-calcareous clays and sands (commonly, or at least formerly, referred to the Lafayette formation) which cover much of the surface of the coastal plain farther south and east are very limited in extent in Wilcox County, so that most of its soils are residual from the Cretaceous and Eocene strata.

In Dr. Eugene A. Smith's report on the coastal plain of Alabama, published by the state geological survey early in 1895 (pp. 194, 591, 592), the "cedar brakes" on that phase of the Midway formation called by him the "Nautilus rock" (from one of its characteristic fossils) in the eastern part of Wilcox County are briefly described. In the soil survey of this county by R. A. Winston and N. E. Bell, published by the U. S. Bureau of Soils in March, 1918, the limestone soils are located for the first time on a map. Four types of distinctly calcareous soils are described in the soil survey report, aggregating 35,264 acres or a little more than six percent of the area of the county. In order of extent they are "Sumter clay," "Houston clay," "Trinity clay," and "Houston fine sandy loam."[1] It happens that practically none of these are visible from any of the railroads traversing the county, and I never saw any of them until I made a special trip on foot for the purpose, across country from Greenville to Snow Hill on June 11–12, 1919.

S. B. Buckley, a botanist and geologist who taught school for a few years around 1840 at Allenton, within a few miles of the largest areas of limestone outcrop in Wilcox County, must have been familiar with them, but in his day such a thing as describing vegetation was scarcely thought of, so that we can judge of his explorations only by the localities given for plants collected by him. In the American Journal of Science 45: 170–177, 1843, he described several supposed new species, among them *Phacelia pusilla* (now regarded as synonymous with *P. dubia*), from "Prairies of Alabama," without definite locality, but since credited to Wilcox County by Mohr. In the Proceedings of the Academy of Natural Sciences of Philadelphia for 1860, pp. 443–445, he described two trees from Wilcox County, but without precise localities. In Mohr's Plant Life of Alabama (1901) I have found 39 species cited as having been collected by Buckley, all but six in Wilcox County; and most of them are characteristic of calcareous soils, though not of prairies. (There seems to be nothing in Dr. Mohr's book, by the way, to indicate that he ever explored Wilcox County himself.)

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[1] The first two series names are misnomers, for these soils are quite different from anything in Sumter County, Georgia, or near Houston, Texas.

It appears from the descriptions in the two works first mentioned that the principal cedar-brake area in the county is the "Houston fine sandy loam," which is nearly all in one body about six square miles in extent, a few miles southeast of Snow Hill. (This is derived from the Eocene "Nautilus rock," while the other three calcareous soil types are mapped as occurring in both the Cretaceous and Eocene parts of the county.[2]) Accordingly ingly I directed my steps thither. Before reaching the fine sandy loam I passed over about two miles of "Sumter clay," a rolling country with drab-colored sticky clay soil, almost uninhabited on account of the scarcity of good water, but nearly all cultivated at one time or another. Like the calcareous parts of the black prairie belt to the northward, this area is now covered mostly with such weeds as *Melilotus alba, Monarda citriodora,* and *Erigeron ramosus,* which are used for hay and pasture.[2a] Along fence-rows and water-ways are such trees as *Juniperus Virginiana, Celtis occidentalis* (?), *Quercus Muhlenbergii, Populus deltoides,* and *Diospyros.*

The "Houston fine sandy loam" area has the limestone rock near the surface, and the soil is somewhat sandy, as the name implies, the sand being doubtless derived from sandy layers in the limestone, and not from any later superficial formation. Where the soil is deep enough it has been cultivated in times past and is now devoted mostly to hay and pasture, like the "Sumter clay." But considerable areas have the rock coming right to the surface, making plowing impossible, and in such places is found some natural prairie vegetation. Throughout the area of that soil the cedar, *Juniperus Virginana,* is practically the only tree. The herbaceous vegetation is very interesting. As in many other places where the soil is very thin, and where there is more rain in spring than in summer, there are quite a number of annuals which bloom in spring and wither away before summer, and no doubt there are also some autumnal species hardly recognizable in June, so that it would be necessary to visit the place at more than one season to get a complete list of the plants.

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[2] In the discussion of the "Sumter clay" in the soil report it is stated that "The soil is derived from the weathering of Cretaceous limestone"; but that is true of only about two-thirds of it in Wilcox County (and of no soil in Sumter County, Georgia, where that series name was first applied).

[2a] See fig. 2, page 27, "Resources of Southern Alabama," Sp. Rep. 11, Geol. Survey of Ala., 1920.

The commonest species in the areas of natural prairie, in order of abundance, as nearly as I could determine in one forenoon, are as follows:

Andropogon scoparius
Polygala grandiflora
Fimbristylis puberula
Houstonia angustifolia
Prunella vulgaris
Erigeron ramosus
Verbena angustifolia
Gaura angustifolia?
Sabbatia angularis
Cyperus ovularis?
Coreopsis auriculata?
Mesadenia tuberosa
Polygala Boykinii
Rudbeckia triloba
Opuntia vulgaris?
Arenaria patula
Sisyrinchium sp.
Ambrosia artemisiifolia
Lepidium Virginicum
Specularia perfoliata
Galactia sp.
Lespedeza sp.

There was also an unidentified moss in some of the more open and rocky places. The first herb listed was by far the most abundant of all. (See fig. 1.)

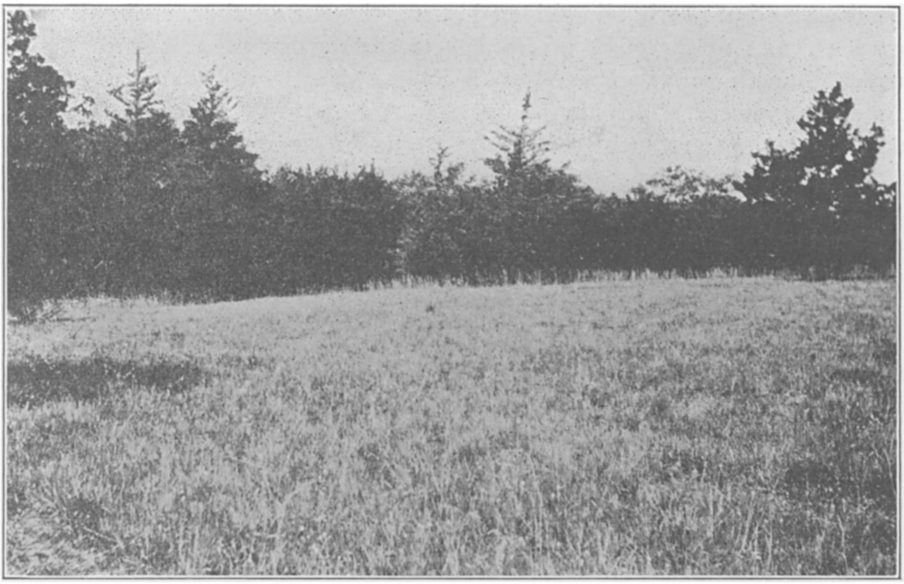

FIG. 1. Natural prairie vegetation on "Houston fine sandy loam," where the limestone comes to the surface. The most conspicuous herb is *Andropogon scoparius,* and the trees are mostly *Juniperus Virginiana.*

A few of the less abundant species are weeds, probably introduced through the agency of cattle, but the majority are unquestionably native. This vegetation bears considerable resemblance to that of some chalk outcrops or bald prairies in the black belt, described by Mohr (Plant Life of Ala., p. 104), and probably has some features in common with the limestone barrens or cedar glades of Middle Tennessee, which have been mentioned several times in the writings of Gattinger and others, but apparently never yet described by a plant sociologist or student of vegetation.[3] But the occurrence of such plants as *Andropogon scoparius, Fimbristylis puberula* and *Polygala grandiflora,* which grow more commonly in poor sandy soils, seems rather paradoxical. One explanation suggests itself, however. Where the rock comes to the surface or near it earthworms must be absent or practically so (as they seem to be in most sandy soils, and on the Hempstead Plains of Long Island, for a different reason[4]), and it is very likely that these plants, like the Ericaceae, many orchids, etc., cannot tolerate the presence of worms about their roots. The omnipresent cedar, too, seems to be a helminthophobe (if one may coin such a term), as I have suggested elsewhere.[5]

The cedar indicates also another feature of the environment that is exceptional in prairies, namely, the rarity of fire.[6] *Houstonia angustifolia* seems to be another pyrophobe, growing both in dry sand and on limestone outcrops, but apparently always in places pretty well protected from fire. These limestone prairies therefore differ radically from the well-known prairies of Illinois, which are said to be well supplied with earthworms, and were noted for prairie fires before they were reduced to small isolated areas by the settling up of the country; and there is apparently not a single native species common to the two areas. Just why fire should be so rare in this part of Alabama it is hard to say, unless it is because of the small size of the individual prairies,[7] those I saw covering only a few acres each.

Just before passing out of the limestone area (whose northwestern boundary is pretty sharp) I examined a small densely wooded valley whose vegetation is worth putting on record here, to illustrate the effect of strongly calcareous soils and abundant humus in that climate (see fig. 2). The commonest species there seemed to be as follows:

Large Trees

Quercus Muhlenbergii
Fraxinus Americana
Juniperus Virginiana
Juglans nigra
Ulmus alata
Liquidambar Styraciflua
Quercus Schneckii
Tilia sp.
Liriodendron Tulipifera
Quercus stellata

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[3] For references to several incomplete descriptions of the Middle Tennessee cedar glades see Torreya, **12**: 154. July, 1912.

[4] See Mem. Torrey Bot. Club, **17**: 267. June, 1918.

[5] Torreya, **17**: 141. Aug., 1917.

[6] See Torreya, **12**: 147. July, 1912.

[7] See Plant World, **20**: 60. 1917.

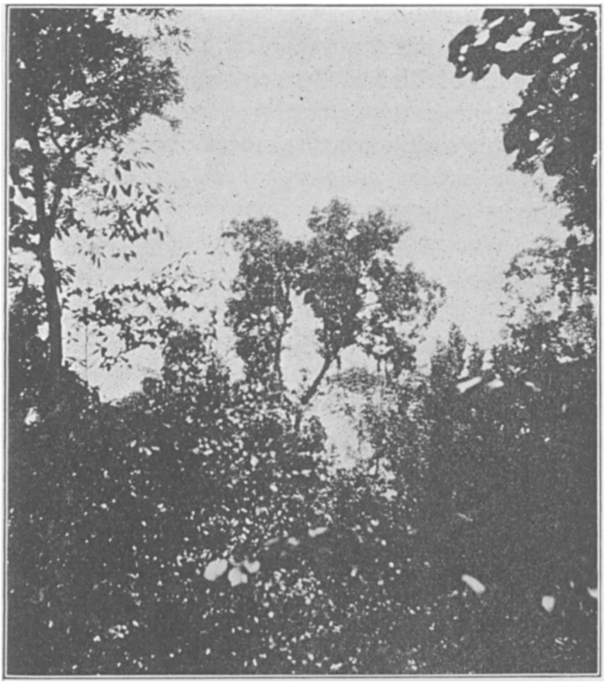

FIG. 2. View in rich woods in limestone valley, showing *Quercus Muhlenbergii, Juglans nigra, Fraxinus Americana, Tilia,* etc.

Small Trees

Cercis Canadensis
Prunus Americana
Ostrya Virginiana
Viburnum rufidulum

Shrubs and Vines

Rhamnus Caroliniana
Berchemia scandens
Callicarpa Americana
Vitis aestivalis
Rhus radicans
Parthenocissus quinquefolia
Cornus stricta?
Bignonia crucigera

Herbs

Tillandsia usneoides
Uniola laxa
Polypodium polypodioides
Elephantopus tomentosus
Sanicula gregaria?
Arisaema Dracontium
Smilax herbacea
Ruellia strepens?
Dodecatheon sp.
Rudbeckia triloba?
Geum Canadense
Erythrina herbacea
Onosmodium sp.

The first and third herbs are epiphytes, and therefore not directly connected with the calcareous soil, though they undoubtedly obtain considerable inorganic nutriment from the decay of the bark on which they grow, instead of getting all their food from the air and rain, as might be supposed.[8] The rest are practically all "mesophytes," but it is not safe to assume that they are all calciphiles. For, as I have pointed out elsewhere,[9] many supposed lime-loving plants are really potash-loving, and can be found also in soils well supplied with potassium but not markedly calcareous. Potassium is essential to most plants, but calcium is less so, and may even have a dwarfing effect in some cases.[10] The luxuriance of vegetation in many limestone areas is probably due to the fact that limestone dissolves more rapidly than most other rocks, thus liberating whatever plant foods may be mixed or combined with it.[11] Snails, earthworms, and other humus-building animals also thrive on a calcareous diet, and thus expedite the formation of humus in limestone regions, where it is not prevented by fire, evaporation, erosion, or something of the sort.

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[8] See Am. Fern Journal, **9**: 99–103. Jan., 1920.

[9] Bull. Torrey Bot. Club, **40**: 396–399. Aug., 1913.

[10] In this connection see Gile and Ageton, Porto Rico Exp. Sta. Bull. 16 (the effect of strongly calcareous soils on the growth and ash composition of certain plants). 1914; Cowles, Bot. Gaz., **59**: 163, 1915. (Review of a paper on the influence of lime on vegetation in Siam.)

[11] Fernald, in his well-known paper on the soil preferences of certain alpine and subalpine plants (Rhodora, **9**: 149–193. 1907; reviewed by Cowles in Bot. Gaz., **45**: 138–139, and by Hilgard in Science, II. **27**: 140–143) has pointed out the marked floristic contrast between potassic, calcareous and magnesian rocks in northern New England and farther north. The plants said to be characteristic of potassic rocks (granite, etc.) are largely Ericaceae and other "oxylophytes," from which a hasty reader might infer that potassium has little effect on vegetation. But the potassic rocks mentioned by Fernald are hard and decompose very slowly, so that they yield their soluble constituents to vegetation at a far slower rate than would a soil of the same composition, or a limestone containing considerably less potassium.

In G. P. Merrill's "Rocks, Rock Weathering and Soils" (revised edition of 1906), pp. 185–226, are numerous analyses of rocks from various places in both hemispheres, and the soils derived therefrom, from which it appears that in the case of granite and other crystalline rocks the percentage of potash and soda is nearly always much less in the soil than in the rock, while in the case of limestone the percentage of the alkali metals increases with weathering. In a limestone from northwestern Arkansas the percentage of potash (K_2O) was 0.35 in the rock and 0.96 in the residual clay derived from it, and in one from the Shenandoah Valley of Virginia the potash increased from 1.08 percent to 4.91 percent with weathering.